The Journal OF THE South Carolina Medical Association

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DR. O. M. WOOD

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EDITORIAL

LEE COUNTY REORGANIZES

Friday evening March 9th, the membership of the Lee County Medical Society were entertained at an elaborate banquet, by the Bishopville doctors, and their wives.

A special feature of this meeting was the reorganization of the society, and this was successfully carried through.

The Councilor, Dr. T. R. Littlejohn, and a number of visiting physicians from Sumter, and Florence, were present.

The participation of the Druggists and Dentists of the city, was an innovation that other counties would do well to follow.

HAMPTON TO REORGANIZE

On March 29th, President Willams and Councilor Hartzog will visit Hampton County, at Estill, and aid the members in reorganizing the County Medical Society.

Dr. Hartzog has been very active in stimulating the interest of the county societies in his District.

THE SECRETARY VISITS CHARLESTON

The Secretary visited Charleston March 20th, and met with the various committees of the Charleston Medical Society in the interest of the approaching meeting of the State Medical Association April 17th, 18th, 19th. Suffice it to say that as usual the profession of Charleston will measure up to their reputation as hosts.

A special feature of the meeting will be clinics at the Roper Hospital, and the other hospitals of the city.

ORIGINAL ARTICLES

DOES ADULT TUBERCULOSIS BEGIN IN INFANCY ALWAYS?

By Wm. P. Cornell, M. D., Columbia, S. C.

On the occasions in which I have listened to discussions on the subject tuberculosis I have been impressed by the fact that no mention is ever made regarding tuberculosis in infancy and childhood.

Knowing that a large per cent of all children have been found to be infected with tuberculosis, wherever large groups have been tested, I have left these meetings with the feeling that something very essential had been left out of the discussions, and as though only part of the story had been told.

The question that stands out is: Why is not more stress laid upon the diagnosis of tuberculosis in its chronic latent stage in the child so that these hundreds of thousands of cases might be prevented from becoming activated into the thousands of adult patients which fill our sanitariums and cost such tremendous expenditure of labor and money.

Does adult tuberculosis always begin in infancy, and if so, is not the period of childhood the age at which the greatest good can be accomplished towards eradication of the "White Plague"?

How is the disease contracted? Intrauterine infection, direct inoculation, and infection through food ingestion, are all possible and should be guarded against, but the one great mode of infection upon which we should center our forces is the tubercular patient whose sputum contains bacilli.

Read before the South Carolina Medical Association, Rock Hill, S. C., April 20, 1922.

Portals of entry: Though tubercle bacilli may enter the body through any part of the skin or mucous membranes, the lung is by far most often responsible, the bacilli being inhaled from the throat. Next comes the intestinal mucous membrane, the bacilli reaching here in food usually, and third, stands the tonsil as port of entry.

The object of this paper being to emphasize the type of tubercular child which, through early diagnosis and proper treatment, can be saved from an active tubercular process lighting up in adult life, it is necessary to briefly review the route of invasion which leads to the chronic latent tuberculosis of childhood, as it is in this stage that our work must be done to prevent secondary extension symptoms from developing.

The primary lesion is always at the point of entry in the lung, intestine, or tonsil, but in the lung is so often overlooked, because of its slight character, that some doubt its existence and believe the primary lesion to be in the lymph nodes.

From the primary lesion the bacilli extend by the lymph channels; by direct extension; by the air passages; by the digestive canal, and by the blood.

The first extension in childhood, in the vast majority of cases, is to the nearest lymph nodes, by way of the lymph channels, which nodes are placed about the main bronchi and the bifurcation of the trachea. Here the disease locates itself while the battle progresses and the child tries to build up antibodies with which to immunize himself. The younger the infant the less chance it has, not only because of weakness incident to its age but because, at this age, it is usually subjected to constant and repeated doses of bacilli from the original source, usually its mother

It stands no chance while in this environment.

It is in this stage of the disease, before secondary extension from this set of glands can take place, that our diagnosis should be made. A secondary extension at this age usually means a hopeless prognosis as such extension results in tubercular broncho-pneumonia, tubercular meningitis or a miliary tuberculosis, all of which are helpless conditions.

As to the frequency of latent tuberculosis in children: Garahan & Iraola (1) found that 75% of the children, even though apparently healthy, responded positively to tests for tuberculosis. Opie (2) says "In a previous article I have shown that the lungs of almost every individual who has reached adult life (18 years) contain foci of tuberculosis which, occuring in any part of the lung and associated with tuberculosis of the regional lymph nodes, have the characters of pulmonary tuberculosis in childhood." "Almost every child is spontaneously inoculated or "vaccinated" with tuberculosis." "The early experiments of Koch confirmed by subsequent observers have shown that a first infection with tuberculosis modifies the course of a second infection." "Koch's fundamental experiment showed that the injection of tubercle bacilli into the subcutaneous tissue of animals already infected with tuberculosis caused a reaction at the site of infection more severe than that of the first infection, but the lesion did not progress and there was no involvement of the regional lymph nodes." "Fatal pulmonary tuberculosis of adults and of older children with few exceptions has its origin in the apices of the lungs and like the second infection of animals, produced by Koch and others, is unaccompained by caseous lesions of the regional lymphatic nodes." "It is probable that the percentage of focal infections in adults is greater than that indicated by the tables (see vol. xxv. Journal Exp. Med.) and closely approximates 100%, for in those instances in which no pulmonary lesion was found tuberculosis of lymphatic nodes in two instances demonstrated only by microscopic examination suggests the probability that corresponding pulmonary lesions had been overlooked." "The age incidence of focal tuberculous lesions of the lungs demonstrates that they have their origin in most instances in childhood." "In the period between 18 and 30 years at least 85% of all individuals have acquired focal tubercular lesions." "That focal tubercular lesions of the lung are occasionally acquired during adult life is shown by the slight increase in the proportion of those with these lesions as age increases from 18 years to old age." "After 70 years of age pulmonary apices of over half of all individuals are occupied by frankly tubercular lesions." Dr. Alfred F. Hess (3) States: "One of the most important advances in recent years in connection with the study of tuberculosis has been the realization that human infection by tubercle bacilli takes place usually during infancy or early childhood."

I borrow freely from this excellent article.

There are apparently more deaths from tuberculosis in the first year of life than occur during any other one year. Because of the frequent difficulty in diagnosing tuberculosis in the first year of life, doubtless many tubercular deaths are returned as "congenital debility," a group that comprises over one-quarter of the deaths of infants under one year.

Hess says: "It is evident, therefore, that, in our efforts to combat tuberculosis attention should be directed to the infant."

After the first two years of life a quiescent period gradually sets in as regards the development of clinical tuberculosis. Year by year fewer children die of tuberculosis although the number of infections steadily increases. During the first few years few deaths occur from pulmonary tuberculosis,

Table 1. Deaths from Tb. in N. Y. City, 1913-1917, show the following:

Age	Pulmonary	Other forms	Total
1st Yr.	205	1064	1269
2nd "	184	967	1151
3rd "	98	604	702
4th "	81	359	440
5th "	74 (642)	280 (3274)	354 (3916)
5-9 " *	63	134	197
10-14 "	114	54	168
15-19 "	514	72	568
20-24 "	938	78	1016
25-29 "	1060	78	1147
30-34 "	1110	62	1172
35-39 "	1397	59	1356
40-44 "	1058	71	1129

*Figs. after 5yrs. of age are averagees of quinquenniums.

the great majority being due to tubercular meningitis, but at ten years this is reversed and thereafter the great majority of deaths are due to pulmonary tuberculosis.

The above table of deaths shows that only one-fifth of the deaths during the first five years are due to pulmonary lesion, and that from ten years on the pulmonary type steadily increases as the other forms as steadily decrease.

More than three times as many deaths from tuberculosis occur in the first five years of life than occurs during any other five year period of life up to the fiftieth year.

Another remarkable showing of Dr. Hess' investigation is the sudden, invariable and marked increase in tubercular deaths at twelve years of age in girls, and at sixteen years of age in boys, as shown in the following table:

Following explanatory reasoning for this sudden increase Dr. Hess concludes: "It is more logical to regard this sudden flare up as an activation, at the time of maturity, of some lesion in the bronchial gland or in the lung, which had remained latent from early childhood."

In a foot note he says "The fact that the soldiers develope tuberculosis generally within a month or two of their entrance into active service is probably best interpreted as the fanning into activity, through the stress of hard life, of old foci of disease."

Brown, Petroff and Pasquera, of Trudeau, New York, (4), throw interesting light on the question of the means by which the tubercle bacilli are tranferred from one person to another. They, in experimentation upon guinea pigs for tubercular infection, tested dust of rooms, telephone receivers, eating utensils, infected hands of

Table 2. Deaths from Tb. in N. Y. City according to sex and 5 yr. Periods.

Age period	1916				1917				All forms				Grand Total
	Pul.		All forms		Pul.				Total				
years	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.			
3-5	54	51	371	308	67	45	403	337	895	741			1636
5-9	23	22	84	78	23	25	92	88	222	213			435
10-14	31	75	57	105	33	79	62	100	183	359			542
15-19	209	292	251	328	215	306	248	338	923	1564			2486
20-24	456	436	494	475	508	566	541	502	1999	1879			3878

patients, the saliva of tubercular patients, transmission by kissing, infection of tooth brushes, the danger of flies, and the danger of coughing. Patients with numerous bacilli in their sputum, and coughing, both from the Sanitarium and from their homes, were selected for the tests. The tests, which are described in detail, were carefully carried out, and their conclusions are set down as follows: "The dangers of infection from dust of rooms, from telephone receivers, from properly cleaned eating utensils, from infected hands through handshaking or from door knobs, and the danger from transmission by infected flies,—have not been conclusively proven and these experiments tend to belittle it. On the other hand, the danger from kissing, or by the use of eating utensils which have not been properly cleaned, is shown."

Realizing that the large majority of apparently healthy children have this latent chronic tuberculosis we should be particularly on our guard in seaching for it in every child to whom we are called, especially when we find them below weight or presenting anaemic appearance.

We must remember that there are no diagnostic symptoms of this latent stage, and that it exists wthout any clinical evidence whatever.

When symptoms do exists they are usually manifestations of secondary extension and we have missed the first stage.

The three general symptoms of tuberculosis in childhood, and which usually indicate secondary extension are, fever, emaciation and anemia.

The pathology of the first stage is that of enlarged bronchial glands, and these may, or may not, through pressure, produce a dry, irritative and often paroxysmal cough suggesting pertussis, except that it does not progress as does that of pertussis. Also expiratory dyspnoea is sometimes seen, from pressure on the bronchi and trachea, especially after crying or coughing.

Inter-scapular percussion dullness when obtained is quite daignostic.

D'Espine's sign consists in an extension downward below the seventh cervical spine in older children, and below the third dorsal spine in infants under two years of age of the bronchophony normally heard over the cervical spines. It is easily recognized and should be listened for every time examination of a childs lungs is made.

Roentgen Ray shows a shadow from the glands along the bronchi if they are enlarged, but those at the bifurcation of the trachea, unless quite enlarged, may be hidden by the spinal column.

Von Pirquet's skin test is now part of the routine examination of all children at most of the large centers, and the day will soon come when our efficient State Health Department will add this to its other propressive measures in preventive medicine. A positive skin test is evidence of the presence of antibodies which are formed only from the presence of active bacilli in the body somewhere. A negative Von Pirquet does not exclude tuberculosis, and it is generally negative in tuberculous children with the following: Miliary tuberculosis and tuberculous meningitis; during measles; after treatment with tuberculin; in very active stages of secondary tuberculosis; and in very poorly nourished children.

Dunn (5) considers the presence of any of these three signs (D'Espine, X-Ray shadow and Von Pirquet) sufficient to diagnose probable chronic tuberculosis, and the presence of either D'Espine's sign or a positive X-Ray, makes the diagnosis practically certain.

The first two, every doctor can do himself and the X-Ray expense will be gladly borne by parents when they understand its value to their baby.

As to prognosis in infancy. Dunn quotes Hahn as follows:

Time of infection	Died	Lived
0 to 6 mos.	87%	13%
6 to 12 "	74%	26%
1 to 2 yrs.	61%	39%

Amongst those who survive there are no reliable statistics as to how many become activated later in life.

As to the time of infection in infancy Hess quotes Bass' figures on four hundred children under six years of age as follows: (over 1000 tests)

Age	Cases Tested	Positive Reactions	Pr. Ct.
1 - 6 mos.	51	4	7.8
6 - 12 mos.	38	6	15.8
1 - 2 yrs.	29	5	17.2
2 - 3 yrs.	45	14	31.1
3 - 5 yrs.	28	12	42.8

Also, that 75% of the children between five and six years were positive.

Though I am not able to answer the title question of this paper with an unqualified yes, still I think the statistics quoted warrant us in the conviction that the very vast majority of cases of adult tuberculosis have been lying dormant throughout the individuals life and that, had it been diagnosed in infancy or childhood, and appropriate treatment instituted and kept up, the chances are that he would not have developed into an active pulmonary tuberculosis later on in life.

How can we prevent our infants and children from becoming infected with tuberculosis and how can we arrest it while latent, or limited to the first set of lymphatic glands?

The only way to prevent their becoming infected is to prevent contact between them and another person who has active (sputa positive) tuberculosis. Hess shows that though any member in the family who has infective sputa is a source of danger, that by far the most frequent person to infect an infant is its mother, and it is now recognized that it is practically impossible to prevent infection of the baby unless it is separated from the mother entirely. This sounds cruel in the extreme but can anyone imagine a mother wishing to deliberately infect her baby when she realizes what certain death she is subjecting it to by keeping it with her? This applies to any other members of the household who have active tuberculosis. Who of you have realized that half of all people over seventy years of age have an active tubercular process in their lung? This means that the grandparents should be particularly scrupulous in learning their status as to tuberculosis before fondling their children's children. Sisters near their twelfth year and brothers near their sixteenth year, who have any cough, should be persuaded to leave the baby alone. Therefore, if possible, remove the baby from the home, and if this is not possible at least keep it away from the others present. If, at every discussion before the public upon tuberculosis, attention, commensurate to its importance, were paid to this child phase of the subject, I feel sure much less adult tuberculosis would be encountered in the future.

Dr. Hess writes of Tuberculosis Preventoriums, places where the infant of the tuberculous mother can be placed for at least a year, and where children in the first or latent stage can be cared for and scientifically supervised, and where the girls and boys at the maturing age may be held under observation. Would that we could realize this state of perfection!

Our first job is to educate ourselves to be on the lookout for, and to recognize, tuberculosis in the infant and child, then, when we have realized the necessity, we begin to think of Preventoriums.

Time limitation prevents a detailed discussion of treatment of latent tuberculosis. It can be briefly summed up under four main headings, namely, regulated rest and exercise, maintenance of proper nutrition, avoidance of repeated exposure to fresh infection, and fresh air day and night.

Probably Heliotherapy should also be included.

(1) Garahan & Iraola. Excerpt, J. A. M. A., Aug. 30, 1919. Frequency of Latent Tuberculosis In Children.

(2) Eugene L. Opie. Jour. Experimental Med., Vol. XXVI., Pg. 263.

(3) Alfred F. Hess. J. A. M. A., Jan. 11, 1919. The Significance of Tuberculosis in Infancy and Childhood.

(4) Brown, Petroff & Pasquera. J. A. M. A., Nov. 22, 1919. Pg. 1576. Etiological Studies in Tuberlosis.

(5) Dunn. Pediatrics.

DISCUSSIONS

Dr. F. A. Coward, Columbia:

There are two diseases, we might say, which have created the public health work of today. One is rabies and the other is tuberculosis. It seems to me an unfortunate thing that in our present scheme of fighting infectious diseases we have included tuberculosis along with typhoid fever, scarlet fever, measles, smallpox, etc. It does not belong there. After thousands of autopsies it is safe to say that every person has tuberculosis at some time in his life. Due to his makeup or something he overcomes it or succumbs to it in childhood or adult life. I do not believe that tuberculosis should be handled by us in public health work today as we are handling it. The infection is there. How many of you have seen a case of actual contact tuberculosis where there was another case in the house? They must be very rare. We have to educate the people and eradicate the thing at the roots. Now, doubtless milk will give bovine tuberculosis to a few children, it will give them swollen glands in the neck, etc. Doubtless some of those cattle have human tubercular infection, which is very fatal to cattle. The chances are that we do not get much milk from such cattle. The problem of tuberculosis must be dealt with in a little different way from the way we fight smallpox, etc. I do not believe that it comes primarily from immediate contact—not that I would do away with the care of the sputum, etc., but we have to fight along different lines.

Dr. W. F. R. Phillips, Charleston:

I think with Dr. Coward that we have to look at tuberculosis, so far as curing it is concerned, from a different standpoint from that of the ordinary contagious diseases. Briefly, my views are as follows: Tuberculosis will not grow in a soil not suitable for it. If we make the soil unsuitable we need not worry about anything else. The germ itself is practically ubiquitous. We know very little about it. We do not know whether it passes from bovine to human, or through a vein, or anything else. The method of infection has been fought over and fought over, and is still a matter of polemics. All we know is that it does come, and comes practically to everybody. I have never seen in the dissecting room a pair of lungs from a person over forty years of age that did not show evidence of active or healed tuberculosis. We all have it. What we have to do is to find out what is wrong with the person's makeup and restore the individual to a fighting condition, and then he will be able to take care of himself. Now, some people come into the world utterly unable to fight it. When we find a person that comes from a family that has had tuberculosis and tuberculosis and tuberculosis, that person is a very unfavorable subject for tuberculosis, and here is where we come in conflict with nature's laws and try to save the unfit. That may be a cruel thing to say, but it is true.

A few years ago I studied the question from an anatomical point of view and presented a hypothesis in which I endeavored to explain why, though in infancy and childhood it is confined to the lymphoid tissues, in adults it affects the lungs. From a physiological point of view, evidently a change has been produced in the tissues. Of the nature of the change we are ignorant. One explanation may be in the effect of the change from the pronograde to the orthograde status. The monkey has the same lesions as the child. It is when we assume the orthograde posture that we change our resistance. We shift from the lymphoid tissues to the respiratory tissues. The apex is the most vulnerable part in man, and the dorsal lobe in the animal. Various hypotheses have been advanced as to why the apex is the vulnerable point—that it is not aerated enough, does not get enough expansion, interference of ribs, different effect of atmos-

pheric pressure on the apex, etc. This does not hold true when we go to comparative anatomy, for the dorsal lobe of the bovine is the most mobile, the most ventilated point of the animal's lung, and it is the most susceptible portion to infection. The only feature that is comparable is that it is the highest point so far as the distance from the earth is concerned. It is probably a diminution of the circulation that leads to the development of tubercle bacilli in these two portions of the lungs, apex in man, dorsal lobe in the bovine.

As to the theory of latent tuberculosis, that a child can carry tuberculosis from infancy latent and have it suddenly flare up, I can not agree to it. It does not seem compatible with the function of the lymphatic tissue. The lymphatic tissue is the protective, fighting tissue of the body. When we find that lymphatics are chronically swollen, it simply means a want of resistance, a want of ability to fight. I can not conceive that germs will stay in the lymphatic glands, the factories of the white blood cells, for years, and then suddenly flare up. It seems to me much more likely that, due to the ubiquitous germ, the person is likely to be re-infected when caught off guard.

Dr. Wythe M. Rhett, Charleston:

I just want to put myself in line with Dr. Cornell on this subject, and to mention not only the infection from the mother, but also from the nurse. The habit in the South, where the negro nurse is the chief nurse for the child, is to accept any one who will come regularly. The incidence among the negro race in the South is very great, and the nurse, in a great many cases, has active tuberculosis, so that the incidence in the white race, among children, stands a chance of being very high from contact with the colored nurse. The nurse coming into a white family should be scrutinized very carefully, and referred to a physician to exclude, as far as possible, active tuberculosis, before being allowed to nurse a child.

Dr. Cornell, closing the discussion:

Dr. Phillips rather knocks the props from under me. His inference is that there is something in the human makeup which makes us contract tuberculosis. Does he mean to belittle the bacillus as the cause? Only eight per cent. of babies before the first six months are infected in Basses statistics. That percentage rapidly increases until at the end of the sixth year, 75% show infection. At what age in life does so much kissing occur as in the first five years? The experiments carried out at Trudeau, N. Y. showed that kissing is almost absolutely fatal, you might say, and if it is true that over fifty per cent. of all lung apices show active tuberculosis after the 70th year of life, I think that the probability is that over ninety per cent. of all people over seventy years of age who cough have tuberculosis, and are a menace to their grand children.

Dr. Parker used to teach me that at puberty the adenoids and tonsils would retrogress and disappear. Possibly Dr. Phillips' explanation about the adenoid tissue being the protective tissue may be the explanation, through its disappearance at puberty, for the sudden increase of tuberculosis of this age. Dr. Hess showed, in some very remarkable statistics, a very marked and very sudden increase in deaths in girls at twelve and boys at sixteen. Does the retrogressing of adenoid tissue, then, wipe away our resistance at these ages? We must not forget that the tubercle bacillus is the cause of tuberculosis, so far as we know, and in infancy the child is subjected to infection in repeated and massive doses, which he can not overcome. They are getting marvelous results in the North in the preventoriums, as they are called, where the resistance is built up through rest, sunshine and good food, and many of the children are cured.

Question: Do you believe that a tubercular mother can infect a baby through breast feeding, or make worse a tuberculous baby?

Answer: No, I do not believe that the infection comes through the milk. But if the mother is tuberculous and has the baby at her breast she will infect it through kissing coughing and sneezing.

THE MEDICAL PRACTITIONER AND THE AMERICAN SOCIETY FOR THE CONTROL OF CANCER.

By J. E. Rush, M. D., Field Director,

Among the most important public health problems confronting the medical profession today is that of cancer control. It is possible to make a division of public health movements into several groups, depending on the amount of educational work which must be carried out before the program can be successful. In one group we find such diseases as Typhoid Fever, Malaria, and Yellow Fever which may be controlled simply by educating a few individuals who possess the necessary power in a community to place the program in operation after they have been shown the desirability of such a procedure. This type of activity is relatively simple because it depends upon the education of a few individuals. Unfortunately, the diseases that can be controlled in this manner are among those which usually do not exact from the populace the greatest economic toll.

Another group of diseases may be effectively dealt with through police power and here again we depend on the education of a few members of any given community. For the most part the diseases which may be controlled by this means we refer to as "communicable" and usually they can be very effectively dealt with by placarding, isolation and quarantine.

There is another group of diseases which are not communicable and in which the education of but a few members of the community is not sufficient to affect the mortality rate. Here, we find cancer, which depends for its ultimate control upon the education of every single adult of the community, with reference to the early signs and symptoms of the disease, for only in its early stages is cancer curable. With the present attitude of the public to seek medical advice only when they are aware of distressing symptoms, they must be told that early cancer is usually painless and that proper treatment cannot be instituted until they have sought the advice of a physician.

The medical profession is interested in all types of medicine whether preventive or curative. As a matter of fact, there really is no hard and fast line of demarcration between preventive and curative procedures any more than there is a dividing line between the metals and the non-metals. The medical profession is interested in all problems of public welfare but when it comes to matters concerning public health they are the only ones who through tradition and training are capable of handling the problems which present themselves for solution. It is the only profession at the present time that is engaged in real preventive medicine and it is the profession of election for this type of work. Usually public health movements have been initiated by the medical profession but in many instances the work has passed into the hands of the laity because the members of the medical profession have been pre-occupied with other important problems.

What we have said with regard to the attitude of the medical profession towards public health work clearly emphasizes the need of control by the medical profession of all public health movements. The profession is particularly interested in the problem of cancer control not only because it is of great humanitarian interest but because of the further fact that cancer is one of those conditions in which it has been clearly demonstrated that the medical profession is the only one capable of offering a solution. While sanitary engineers, epidemiologists and others may be of great value in the conduct of specific public health movements their training and experience does not make them capable of helping in cancer control. The slogan of

the American Society for the Control of Cancer that "Early cancer is curable if you will but consult your medical practitioner in time," again clearly emphasizes that the physician is the only one capable of reducing the mortality from cancer.

Another interesting feature of the move ment for cancer control is that the establishment of diagnostic clinics during National Cancer Week is of some educational value to certain members of the medical fraternity because important points of differential diagnosis between early carcinoma of tongue, for example, and primary luetic ulcer, are demonstrated. The cancer movement in this respect, is one of the few that attempts to repay the physician for the great effort he has expended in its behalf.

It has been claimed by some of the unthinking individuals among the laity that preventive and curative medicine are diametrically opposed. They do not realize that there is, in the last analysis, but little difference between preventive and curative measures. For example, all physicians take blood pressures and make urine analyses during the course of a pregnancy and not by the wildest stretch of the imagination can this be interpreted as a curative measure,—it is a preventive measure pure and simple.

Through various educational movements which are now being conducted to instruct the public with regard to conditions which are definitely preventable; the great mass of the people are gradually coming to realize that the physician must be looked upon as a teacher and adviser rather than one who is to be consulted only when symptoms of a diseased condition have manifested themselves. The physician, too, realizes that this teaching attitude is appreciated by the public for by this means he is able to prevent premature deaths among his clientele. Not only does he spare the patient in question for future usefulness but, more important, he does not divorce the rest of the members of that particular family. The physician realizes that the most appreciative patient is one who, through early advice and proper instruction, has been saved from untold suffering and an untimely death.

All health movements if properly managed and ethically controlled by the medical profession will not only eliminate certain objectionable features present in some of them as now conducted by the laity (who have no appreciation of medical ethics) but such activities will help consolidate the medical profession against the ever increasing influence of the cults. It is true, that we as a profession, do not heartily approve of certain public health movements now in progress, because they do not conform to our ethical code. If they were controlled by the medical profession this objection would be removed.

It must be realized that the cults never would have existed had the medical profession taken a definite stand against them, but realizing that "Imitation is the sincerest flattery", we have allowed them to go on:—to exploit the public until even the great mass of the people has recognized the lack of sincerity which prompted the various movements.

The proper extension of these ideas relative to organization in order to control public health problems contains within it the answer to the proponents of that most preposterous type of activity known as "State Medicine."

The organization for cancer control is dependent upon the activities of the medical profession; and therefore the units upon which the organization is built are the State and County Medical Societies. The whole movement has been endorsed and approved by practically all national, sectional, state and local, medical and surgical bodies, because it is entirely controlled by the profession itself. In the perfected organization for cancer control, we have the ground work to handle other problems of a public

health nature; be they ones already in existence or future ventures. By proper organization, too, we shall be in a stronger position to abort detrimental legislation, whether directed at us or to legalize the ignorant cults. A public health problem directed solely by physicians will do more to properly organize the medical profession than any other type of activity.

It has been pointed out that if we do not seriously consider the "scientific attainments" of the cults, then every preventable death is a reflection on us. It has been claimed that the fact that the patient did not come early enough to us for examination and advice is no excuse;—that we, as the only logical profession engaged in the practice of the healing art should have the undivided confidence of the public to such an extent that they will report to us what are very trivial matters and thus give us opportunity to institute proper procedures in time. In the vernacular of the street, it has been suggested that we should "sell ourselves to the public"; which in other words means that there is at the present time a great need of ethical publicity on the part of the profession. It really seems that this would, to a very great extent, increase our usefulness to the community in which we practice. If this is true, then no physician can be so busy that he cannot devote a small amount of time to help in the campaign for cancer education, because by so helping, he is not only advancing his own usefulness to his community but is of the greatest value to his medical brothers and to his profession.

A few members of the laity have explained what they have interpreted as apathy on the part of certain of the medical profession toward perventive medicine, by emphasizing the fact that preventive medicine was diametrically opposed to curative measures. We of the medical profession realize the fallacy of this. Let us consider an analogy from the field of engineering. Suppose that ten engineers were bidding on a contract to construct a road between two adjacent cities. Only one, could be successful. but would the others put obstacles in the way to prevent him from completing his task? The answer is apparent. They would not; for they would realize that when the public had seen the value of this road, they would demand similar ones in all other directions and hence the other engineers would have an opportunity to build some of them. I realize that the above example compares a business conducted purely for monetary return, to a profession which interests itself chiefly with humanitarian efforts, but the very few of the public who believe that all persons are actuated by ulterior motives should be answered. The good roads analogy applies directly to medicine, for the medical practitioner realizes that each time the public is convinced that it is unnecessary for them to suffer with various ailments they demand the removal of others which heretofore they patiently tolerated. An example may illustrate this point:

A friend of mine who for many years was almost an invalid from recurrent attacks of what was then diagnosed as "inflammation of the bowel" and for which, at that time there was no known cure, was simply forced to allow the condition to exist which undermined his health and lowered his efficiency. At the present time because of the knowledge of the laity concerning chronic appendicitis he would know that an operation requiring him to be at a hospital for but two short weeks, would give him complete relief, and enable him to resume his life's work at a greatly increased efficiency.

Our medical ethics instituted at the time of Hippocrates admit of no change; but our interpretation of them may be broadened to meet the changing conditions: especially those which have been brought about during the past two or three decades.

It may be necessary to change our ideas regarding proper non-personal publicity for the medical profession as a whole and for our state and county societies. In this connection I am reminded of the story of the young color-bearer at Gettysburg who had advanced somewhat ahead of the lines, and when ordered back to his position by this commanding officer replied, "Bring the line up to the flag."

RADIATION

By Leonard J. Ravenel, M. D., Florence, South Carolina.

Much is being said and written of the therapeutic uses of radium and X-ray. One in daily touch with the subject can keenly appreciate the vast difference of opinion being expressed up on its numerous phases, and consequently is easily led to assume others more remotely concerned find it difficult to draw satisfactory conclusions from what they hear and read. For this reason the writer desires to present certain known scientific facts, to set forth established laws governing the uses and action of these remarkable agents, and to mention a number of objective clinical results attestable from personal experience and observation; all forming a definite basis for their employment.

Radium is an element. It is marketed in the form of one of its salts, usually the sulfate or chlorid. Such salt emits rays of three kinds, designated as alpha, beta and gamma, at constant rate and ratio. The alpha and beta rays are not very penetrating, the latter most so and are stopped entirely by about 1 cm. of soft tissue. The alpha rays can be completely arrested by a sheet of thick paper. On the other hand, gamma rays represent the mose penetrating radiation known and can traverse tissue the thickness of the body with but little loss by absorption.

X-rays are formed from atomic dissociation occuring in vacuo under electrical stimuli. The beam from any tube at any degree of excitation contains heterogenous components; that is, rays possessing such varied degrees of penetration as to render them analogous to those from radium.

The degree of penetration of any ray is determined by its wave length. Because of the characteristics of the lement, wave lengths of alpha, beta and gamma radiation are fixed and unalterable. With roentgen rays, however, the maximum of penetration is fixed by the amount of voltage at which they are generated, the greater the voltage the shorter the wave length, and vice versa, although as previously stated, regardless of all factors, and roentgen beam contains very variable components in this respect which for sake of convenience are referred to as "soft" and "hard", the latter being made up of the shortest rays. In order to duplicate the wave length of the gamma ray of radium in the X-ray spectrum it would be necessary to excite the tube at approximately a million volts.

It will thus be seen that both roentgen and radium radiation is heterogenous. Should it be desired to employ only the more penetrating portions of the beam or spectrum it becomes necessary to arrest the less penetrating, and in practice this is done by interposing between source and tissue certain metals to act as filters.

The passage of radiation through tissue or matter sets up other rays spoken of as "secondary." These have quite long wave lengths and are hence quickly arrested by the substance in which they are formed. The amount of secondary radiation generated is in direct proportion to the amount of primary going through, irrespective, within very wide limits, of the wave length or velocity of the primary.

Inasmuch as it is conceded that under proper conditions the biological action of

radium and x-rays are the same, we become more concerned clinically with methods of applying them to best advantage than attempting to use one agent in place of the other from any fancied greater benefit to be derived from it. The selection is determined very largely by and from physical laws governing the concentration and divergence of light, which in substance mean that intensity of radiation varies inversely as the square of the distance.

The biologic reaction taking place in radiated tissue extends from stimulation of the cells in their vital processes to degeneration and necrosis. In order for reaction to occur, however, it is absolutely necessary that radiation be absorbed. In other words, it is the ray arrested or taken in by the cell, whether it be of primary or secondary character, that causes effects, and not the ray which goes through or traverses it. The amount of reaction is thus in proportion to the amount of absorption. This apparently lost sight of occasionally in the maze of other factors wherein substitution of more favorable type of radiation from a strictly physical viewpoint detracts from the real purpose. While considering the biologic effects of radiation it is well to point out also that normal cells vary in degree of radio-sensitiveness just as do those comprising malignancies, though fortunately the latter are as a rule considerably more susceptible than the average normal.

Owing to the terrific expense of radium, very few individuals or institutions possess much over 100 milligrammes. This quantity, or a larger, owing to the factors involved, does not admit of external application for deep therapeutic purposes, and when this is attempted resort must necessarily be had to the X-ray which lends itself much more favorably.

In the X-ray field we have a choice of two types of apparatus yielding respectively 140,000 and 225,000 volts, and tube currents of from 5 to 8 milliamperes.

Because of the fact that radiation of increasing penetration is produced as voltage is raised, machines and tubes of higher capacity obtain such advantages as may be derived from rays of this type, and when used in the treatment of deep seated conditions can without doubt supply the theoretical dosage deemed necessary below the surface expressed in terms of *unabsorbed* primary radiation, in less time than can be done with machines of lower voltage ratings. However, the same total of unabsorbed primary ray can be attained at the same depth with apparatus of the latter type by increasing the number of portals through which the energy is directed into the body, as can be demonstrated practically and theoretically. This entails a longer time to which the patient must be subjected to radiation and corresponding inconvenience. But it is likewise true, because of the facts hitherto enumerated and especially those relating to changes in tissue (which are dependent upon absorption) that when a same amount of radiation is gathered at a specified distance from the surface by the methods described with the lower voltage appartaus, the co-efficient of damage is greater in it per square centimetre and per unit of radiation volume than is the case when more penetrating rays are employed. This happens from relatively greater percentage of primary radiation absorption occurring per centimetre at lower voltage generation. It may be said here in debating this point that on the other hand the difference is offset by secondary values accompanying the proportionate less degree of absorption of primary rays of shorter wave lengths but such is not strictly the case, because, while granting for the sake of argument that both secondary rays and absorbed primary rays are capable of causing equal effects measure for measure, at the same time in order to

reach an approximation in terms of biologic reaction, the particular tissue would have to be acted upon considerably longer by the more penetrating radiation, which, in practical applicability, would cause too much damage in interposing material when only a few points of entry are used for it in deep work.

A clinical demonstration of the relative effects of rays of opposing degrees of penetration can easily be made upon the body surface by exposing separate areas to equal quantities of long wave length radium beta radiation and short wave length radium gamma, whence the difference (conservatively 20:1) necessitates a great increase in the duration of exposure by or from scopic cellular change. Inasmuch as little, if any, absorption of gamma the gamma in order to bring about an equal degree of microscopic and macro-rays can take place within tissue the thickness of the epidermal and dermal structures, it is obvious that any reaction showing therein from them is directly the result of absorption of secondary rays set up by their passage. Thus is afforded indisputable evidence that the secondary radiation effects cannot counterbalance those derived from primary radiation absorption when even volumes of the two types of rays are administered within given periods of time.

The depth dose should therefore not be altogether reconed in terms of primary radiation reaching it but rather in terms of primary absorption occurring in that level, plus such secondary values as may occur, and the rule can be formulated, that whether in deep therapy or superficial, the object should be to apply to the diseased area the least penetrating radiation possible in order to secure the maximum of damage to the cells comprising it.

It is obvious that a certain degree of penetration is absolutely necessary in deep work, but ultra-voltage, meaning ultra-penetration, will probably not be accepted in the future, notwithstanding it admits of more homogenous irradiation of different layers because as explained, when in to the initial amounts of energy from two types of rays are the same at the surface, there is not as much absorption occurring per unit volume beneath from those of short wave length, and hence proportionately much longer exposures must be made with them before the same biologic effects to be accrued are produced in a given tissue. Consequently, when employing high voltage for deep therapeutic purposes as afforded by some of the new machines exceeding care must be taken that stimulation is not brought about in the tumor instead of destruction, and conversely destruction instead of stimulation in the normal tissues.

As arguments for the employment of higher voltages, we are told that clinical results become better and that patients are subjected to less inconvenience from the shorter time of exposure. The last is admitted, but it must be remembered that these higher voltage applications are of quite recent origin, and coincident with their adoption by certain operators the *amount* or radiation was enormously increased as permitted by the use of heavier filters and much more attention was paid to depth distribution. These factors, more than anything else, improved the statistics. Yet as has been outlined, a corresponding increase in the amount of radiation at lower voltage, when administered through more portals, will make the results equal or better because the biological changes are greater, and time will tell the tale. I wish to state in this connection that immediate results from the lower voltage apparatus have been greatly enhanced in our hands by the use of newer techinc applied to it. I fully agree with Opitz, who, in speaking of treating cancer by radiation says "we should not treat cancer, but cancer-sick human beings," but at the same time I do believe when we are

dealing with this horrible malady we should do the best we can to destroy it if even at the expense to ourselves and patient of such time as is occasioned by the use of 140,000 volts at 5 milliamperes, for I am in accord with the adage which holds "the longest way 'round is the shortest," and consequently the surest.

It was not my purpose to enter into such a lengthy discussion of these priciples, but it became necessary as the thought arose that we should not let enthusiasm get the better of judgment in the sense of recent developments principally embodied in heavier apparatus, for, while not meaning to belittle any of the work connected with it, which I greatly admire, it is none the less true that science sometimes requires a considerable time to recognize that which to close observation is prima facie evidence. The writer is well conversant with theoretical considerations used as a plea for higher potentials in deep therapy, but is of the opinion some of them will undergo revision in the light of subsequent experience wherefrom it will be found that error is committed in assuming that if an erythema is effected on the skin equivalent reaction becomes established at the nether point when the measurements at each correspond, since said measurements, especially at the latter, by iontoquantimeter or photograph, do not altogether mean or should not be read to altogether represent intensities of *effective* radiation. All in all the subject is a complicated one deserving much deliberation and the precepts of some of its features are worthy of close study.

What has been discussed would merely represent very interesting phenomena were it not applicable to the alleviation of numerous human ills, and therefore it is desired to briefly summarize what we know can be done with radiation from what we have witnessed, and at the same time classify certain indications for its use.

To begin with, we consider that cancer is not primarily a surgical disease, because when cancer becomes established it has generally advanced to structures beyond reach of the knife, and when in its earliest stages can generally be eradicated to better advantage by non-surgical measures. The dread cancer of the uterus is well illustrative of this statement, and we now have a number of apparent cures where X-ray and radium treatment was instituted in both extremes of development. One of these cases had presented upon admission ulceration of the cervix, cauliflower-like masses in the vagina and fixation of the organ. Approximately a month following the radiation laparotomy was performed for other trouble whereupon the uterus was found to be shrunken, movable, and almost cartilaginous in consistency, with fibrotic changes throughout the pelvis and no evidence of malignant disease, as was also noted from inspection of the vaginal vault. In cases of this type we have inserted radium needles locally and have crossfired from without with the X-ray tube.

A patient under our care with carcinoma of the caecum has been so benefitted from X-ray treatment alone that the mass which filled the right lower abdomen has entirely disappeared, accompanied by subsidence of the symptoms and a gain in weight of thirty pounds.

We find that cancer of the stomach lends itself less favorably, mainly because of the difficulty in administering sufficient dosage due to the severe reactions occasioned from large amounts of radiation given in this region. However, we have a case that has been kept comfortable for two years who suffered a recurrance at the pylorus following partial resection and gastro-enterostomy.

Our results in a series of cases of cancer of the breast presenting axillary and clavicular metastases have been poor from following the custom of pre and post-operative raying plus surgical removal of the gross mass. We are much inclined from a number of reasons to discontinue

this combination in the future and employ only radiation. It would appear, however, that mammary carcinoma will continue to maintain one of the worst ultimate prognosis in the realm of malignant disease.

Certain forms of sarcoma appear very amenable. As an example I refer to a growth the size of a football filling the right axillary space and extending below it, of which all visible traces have gone succeeding one massive treatment with roentgen rays, and there has been no evidence of local or remote recurrence since the work was done six months ago. We have also obtained improvement and relief in some patients suffering from osteo-sarcoma which is considered extremely resistant to all forms of treatment.

Epitheliomata and carinomata upon the surface have completely succumbed in practically every instance out of a conservative total of fifty cases treated by us comprising growths covering small areas to extensive and advanced processes. One of the latter had eroded so deep as to expose the large carotid vessels, and this responded to X-ray so that its site is now occupied by fibrotic tissue with very little deformity and complete cure so far as can be ascertained.

Space prohibts further discusssion of the subject of malignancy, and in concluding it I wish to say that while the word "cure" is a bad one to use in referring to the treatment of cancer, there can be no question but that very remarkable and hitherto unattainable results are being brought to pass through therapeusis with radiations, and the vast majority of cancer patients have every reason to anticipate, if not eradication, marked recession, relief from suffering, and prolongation of life.

It is not to be surmised that cancer offers the only field of usefulness for X-ray and radium, as even a larger one is had in the treatment of benign pathology. Under this heading, a consideration of hemorrhage from the non-pregnant uterus is quite applicable because of its frequency, and resistance to ordinary measures adopted for cure or relief. Fibroids are often a source of pernicious bleeding, particularly the submucous and intramural varieties. The surgical attack implies total or sub-total hysterectomy, and hence we feel it should be limited to those very large tumors causing pressure and other symptoms, and to others that are largely cystic or contain wide areas of calcification, since the remainder can readily be removed with either X-ray or radium. The profession has come to realize that hysterectomy is the last court of appeal in myoma of the uterus, and need seldom be resorted to if radiation is used. The common and persistent bleeding taking place at the two extremes of menstrual activity is so amenable to radiation that this is now a "closed book". A large number of cases within our experience furnish the substance for these remarks.

In hyperthyrodism we have come to confine operation to those cases associated with extremely large tumors, and even these are subjected to radiation before the patient is subjected to the knife in order to restrict the tax and danger attending rapid absorption of large amounts of thyroid secretion as accompanies and immediately follows operation. We possess a very close check upon what is happening through estimations of the basal metabolic rate. Radiation accomplishes no result in colloidal or cystic goiters. It might be mentioned we have treated two cases of hyperthyroidism by this method that developed after operation performed to remove the greater proportion of the gland, and we believe these patients would have been spared the scars and inconvenience had they first been treated with X-ray.

As to the thymus, a case is recalled of a male child suffering from dyspnoea and cyanosis due to its persistence, where X-ray treatment afforded a complete cure as shown by disappearance of the gland from

radiograms taken before and after, and total relief clincally. He has developed into a sturdy boy without experiencing further trouble.

Several cases of Hodgkin's disease have undoubtedly been benefitted far beyond the prognosis allowed in the past. One in particular with a glandular collar and mediastinal growths has been able to resume his regular duties and has remained free of objective and subjective signs of the malady for a considerable time. The transformation from a weak, thin and anaemic individual to one of robust strength was in his instance nothing short of the miraculous.

We have cured many people of certain intractable skin lesions, notably eczema, pruritus, naevi, keloids, lupus erythematosus and vulgaris, tuberculous glands, etc.

I have attempted to draw upon our experience to show in a general way types and forms of disease where radiation is not only applicable, but where it offers the most chance for cure and relief, while not calling attention to all of them as is beyond the premise of this article and we have no doubt but that our observations are in line with those of others similarly engaged.

What the future will have in store it is difficult to surmise. It appears to the writer that broadening of the scope and efficiency of radiation is dependent upon additional knowledge of the biologic changes it is capable of producing, rather than from improvement in appliances. We must first learn to use that which we have.

THE SPINAL FLUID AND SYPHILIS

By H. M. Smith, M. D., Columbia, S. C.

Examination of the blood gives no indication of syphilis when the lesions are strictly confined to the neural tissue of the central nervous system. A negative blood Wassermann means nothing so far as central nervous system involvement is concerned, for there are various types of neurosyphilis without any positive blood reaction. When there is an associated vascular involvement, as is often the case, then we may expect a positive Wassermann reaction of the blood.

On the other hand, various types of neurosyphilis may or may not give positive spinal fluid findings, dependent upon the character, type, and stage of the neural involvement. But before considering this phase of the subject in more detail, allow me to make mention in particular of the four spinal fliud tests that are of especial value in the diagnosis of neurosyphilis, with some remarks concerning each.

(Read before the Second District Medical Society July 19, 1922, Columbia, S. C.)

1. *The Cell Count*—Normally the spinal fliud may contain a few lymphocytes, up to as many as seven or eight per cubic millimeter as the probable normal maximum, counted with the Thoma blood-counting chamber. An appreciable increase in this number is strongly suggestive of neurosyphilis or tuberculous meningitis. The test should be made with freshly drawn spinal fluid, and any physician with a microscope and a counting chamber can easily learn to do it.

2. *The Globulin Test*—In testing for globulin, normal spinal fluid remains clear or may become faintly opalescent, while with a pathologic amount of globulin present, as occurs in menigeal inflammations and in various types of neurosyphilis, the test shows a distinct cloudiness or a flocculent precipitate. Noguchi's butyric acid, the Norne-Appelt, or other tests may be used. This is a simple chemical test which any one can perform.

3. *The Colloidal Gold Test*—This test consists of a series of color changes in graded dilutions of spinal fluid when mixed with the colloidal gold solution. The color

variation in the test tubes, when the test is positive, gives, when charted, one of several "curves," the two more important being the "paretic curve," always present in paresis and taboparesis in untreated cases, and the "luetic curve," which excludes paresis and is indicative of tabes or cerebrospinal syphilis. The reagent can be purchased ready made, and the test is fairly simple.

4. *The Wassermann Test*—Not all cases of neurosyphilis give a positive Wassermann reaction with the spinal fluid, but, when present, it proves the existence of neurosyphilis. Such reaction, however, does not at all indicate the degree of activity of the infection.

The blood serum may be positive and the spinal fluid negative, but still the patient may have some form of neurosyphilis. Both blood serum and spinal fluid may give a negative Wassermann, and yet again may the patient be affected with a syphilitic involvement of the central nervous system. Both spinal fluid and blood may be positive thus showing a combined neural and associated involvement. The Wassermann reaction of the blood bears little or no relation to the reaction of the spinal fluid, this condition being due to the neural origin of the "antibodies" of the spinal fluid.

These four tests of the spinal fluid—the cell count, the globulin test, the colloidal gold test, and the Wassermann test—are of great value and importance from both diagnostic and prognostic standpoints.

Now, let us return to the various types of neurosyphilis with their various spinal fluid findings.

1. *The following types of clinical neurosyphilis* show negative spinal fluid findings:

(1) Vascular neurosyphilis,—the purely vascular form, only the blood vessels of the central nervous system being affected, in such conditions as thrombosis, hemorrhage, cerebral aneurism, and endarteritis obliterans.

(2) Tabes,—incipient, treated, "abortive," and late degenerative forms.

(3) Cerebral gamma.

(4) Syphilitic cerebral nerve paralysis, due to syphilitic meningitis.

(5) Syphilitic spastic paraplegia.

(6) Syphilitic epilepsy.

(7) Syphilitic psychosis, of the non-tabetic and non-paretic type, such as syphilitic paranoia or syphilitic dementia.

The spinal fluid findings in these types are usually negative, or essentially so, with all of the four tests above mentioned. However, in cerebrospinal syphilis with co-existing vascular and actual neural involvement the spinal fluid may be negative, may show only an increase in cells and globulin, or may be positive with all four tests. Again, in intermediate stages of tabes there are often cases with mildly positive spinal fluid findings.

It is claimed that some of these cases with negative findings afterward develop positive findings, and, on the other hand, that some cases with positive findings show a spontaneous disappearance of symptoms and a return of the spinal fluid to normal. It is interesting to note that laboratory evidence of active neurosyphilis with negative spinal fluid findings may often be obtained by a provocative injection of arsphenamin, following which the spinal fluid may show a positive Wassermann, an abnormal cell count and globulin content, and a typical gold curve,—any or all of these.

2. *The following types of neurosyphilis*, with signs and symptoms of central nervous involvement, often give positive spinal fluid findings:

(1) Tabes,—except in incipient, treated, "abortive," and late degenerative forms, as previously noted.

(2) Taboparesis.

(3) Paresis.

Each of these usually shows an increased cell count, an increased globulin content, and a positive spinal fluid Wassermann, while with the colloidal gold test tabes gives a "luetic curve," thus excluding paresis, and taboparesis give a "paretic curve," thus excluding tabes and so-called cerebrospinal syphilis. It must be noted, though, that the "paretic curve" is sometimes found in meningovascular syphilis and in some forms of early neurosyphilis. The spinal fluid in these three types frequently gives results with all four of the tests described, sometimes with only one or two or three, and sometimes again it is either mildly positive, or, rarely, even negative throughout.

3. *A third group* of cases of neurosyphilis, without any clinical signs or symptoms of central nervous system involvement, shows positive spinal fluid tests.

In such cases the spinal fluid is doubtless persistently positive, perhaps for many years prior to the development of neurosyphilitic symptoms. It is believed that the central nervous system is very frequently involved by an active syphilitic process during the early period of generalization, and consequently the absence of clinical signs and symptoms does not at all exclude syphilitic infection of the central nervous system. However long the period may be, whether ten, twenty, or thirty years, from the early involvement of the central nervous system to the final appearance of clinical symptoms, it is the general consensus of opinion that the spinal fluid changes precede by many years the appearance of subjective and objective symptoms of neurosyphilis.

Inasmuch as probably 25 to 30 per cent. of all cases of secondary syphilis sooner or later develop infection of the central nervous system under the inadequate examination and treatment that are unfortunately and inexcusably too general, and in view of the fact that examination of the spinal fluid may often show, even in the early stages of syphilis, a beginning neurosyphilitic process in the absence of clinical signs and symptoms, it is of the greatest importance that the physician should regard every syphilitic, no matter how early the stage, as a potential case of neurosyphilis.

Not only in cases of suspected clinical involvement of the central nervous system, be the blood reaction negative or positive, should the spinal fluid be tested out thoroughly, but, in addition, in all cases of primary or secondary syphilis a lumbar puncture should be made and the spinal fluid properly examined, at least after the end of the second thorough course of antisyphilitic treatment, about six months after the infection, or earlier, if indicated. In tertiary cases, without signs and symptoms of neural involvement, this may be deferred until after the administration of complete thorough treatment, but in no case should any syphilitic patient be discharged as cured without the information gained by lumbar puncture. When the spinal fluid is positive it should be re-examined yearly, and when it remains negative for a period of one year examination every two years will then suffice.

Without belittling whatever the extreme importance of the spinal fluid tests in syphilis, it is of even greater importance that a thorough neurologic examination of the patient be made from time to time for the detection of any abnormalites of the nervous system, that thorough examinations of the eyes be made for the detection of any pupillary, eyeground, or other ocular abnormalities, and that repeated examinations of the patient be made for the detection of any cardiovascular changes, by means of all of which the physician may often obtain an early clue to the possible involvement of the central nervous system.

It is only by such careful, thorough analytical and clinical means of detection that the physician, forewarned as to the neural condition and forearmed as to the proper treatment, can hope to steer his patient clear of neurosyphilitic pitfalls.

TUBERCULOSIS AS A PUBLIC HEALTH PROBLEM IN THE SOUTH

By E. Paul Knotts, M. D., County Health Officer, Newberry, S. C.

The medical and public health problem of the south is that one concerned with tuberculosis. It is amazing to review the results of work against tuberculosis in the northern and Eastern States and to observe how efficiently and systematically the work is carried on. Yet the care of the tuberculous victim in the congested tenement district is most difficult even for the most efficient organization. In the South there exists just as grievous problem in the negro because of his temperament and habits. With so large a proportion of its population living in an unsanitary manner and who are coincidentally peculiarly susceptible to tuberculosis, the south may be regarded as the frontier of the fight on tuberculosis.

The south has done great things along these lines but it has been largely personal. As a result it is only the white population that has reaped any benefit and if we are to believe the statistics that benefit has been offset by some other factor. It would seem reasonable to suppose that this undetermined factor may be accounted for by the fact that the medical profession and the public health agencies have not properly attacked the negro problem with relation to tuberculosis. The reasons for this are many. The negro is inherently a poor subject to inculcate the principles of good living. He is content to live in a squalid shack, surrounded by an ample family, his home musty and unkept, doors and windows closed, cleanliness of little concern. This is true of personal hygiene also. The rations most often is unbalanced. These are some of the reasons why tuberculosis exists among the negro people and why it will continue for some time.

Yet the life of the negro is intimately interwoven with the life of the white people. As domestic they become virtually members of the family, as cook, maid and laundress. As nurses they enjoy a companionship with the child that is second only to the mother. When stricken with tuberculosis it requires no keen imagination to comprehend the situation which exists. The patient is not forsaken by his church members or fellow "lodge" members. On the contrary all come to visit him and tarry long in this duty, giving full possibility for the spread of contagion. And this is the outstanding feature of the hard problem to be solved. The negro will not admit long of restraint or isolation. At home it is almost impossible to have him exercise the necessary precautions and he is fearful of going to the sanitarium and will not remain there long enough when he does go. Here in South Carolina we have had sanitarium space for negroes for only a short time and it has not had time to make any impression on our negro tuberculous population. I tell you that any plan to eradicate tuberculosis that fails to include the negro in its plans is doomed to failure in the south.

Because of its widespread prevalence and often its apparent hopelessness tuberculosis has long been the forte of the fakir in medicine. The human organism has in its makeup that quality of optimism that never gives up. The fargone consumptive spitting his life away, comes to his doctor who woefully wags his head and truthfully tells him that his days are numbered. It is surprising the recuperative powers of apparently dying consumptives. So startling is this phenomenon sometimes as to make the practioner doutful as to the accuracy of his bad prognosis. Usually the outcome is little affected by these remissions. However should one of these remissions occur coincident to treatment by some fakir we

(Read before the Newberry County Medical Society Feb. 9, 1923)

will see a miraculous turn of groups of people away from their doctor to this person. Perhaps it may be Peruna or Scott's Emulsion in which case the local drug store may have a run on their stores in these commodities. This is a condition which will continue to make millionaries of patent medicine manufacturers and allow the various quacks to continue to exploit the public for personal gain. It is well known to you all that, before death has intervened the average patient who suffers from tuberculosis will have consumed several carloads of tonics, stimulants, pills and dopes and what not. When all else fails, if there is a spine adjuster or faith healer convenient, these are consulted and their respective arts invoked.

That these agencies do provoke much hardship on those patients sick with tuberculosis is most certainly true, for they destroy the confidence of the patient in his physician, they teach him that his disease is not microbic and they delay if not totally prevent the institution of the correct treatment. Then in my opinion the second step in the eradication of tuberculosis is the defeated quackery and the breaking down of the patient medicine industry.

Slater[2] insists that childhood is the time when tuberculosis infection occurs and 10% of those infected will develope clinical tuberculosis. Koffler[3] in his report of his investigation to discover the extent in which members of families in which tuberculosis is present become infected states: A patient expectorating tubercle bacilli in large quantites will infect all the children in the family except those over one year of age who will often show no reaction in spite of every opportunity to become infected. Viton[4] concurs in this and he thinks that occult, dormant and masked infection with tuberculosis is frequent in children and that most infections in adults is a flaring up of the infection acquired in childhood. Schram[5] found from 53.1 to 80% giving a positive tuberculin reaction of 500 children under 9 years of age in homes where there was some tuberculous inmate. Among 168 children in homes in which tuberculosis seemed to be particularly contagious positive reactions were obtained in from 67.5 to 100% in all over 5 years of age. The experiences related demonstrate that it is impossible to preserve young children from the contagion when some member of the family has tuberculosis without greater education, and isolation. Tayloro and Moorman state that the routine history taking in their cases of tuberculosis show childhood exposure in 62% of 200 adult cases. This preponderance of childhood exposure in connection with adult cases strongly suggests re-infection from within, rather than from without. Baldwing and Gardner state that the vast majority who are destined to develope tuberculosis after they are 21 years of age have acquired it as infants or in childhood. In this there is concurrence of practically all the recent observers of this disease, Fontes[8], Baldwin[9], Ickert[10], Oddenberg[11], Kock[12] and Mollers[13]. Baldwin[9] says that he believes that there may be periods of mild tubercle toxemia between the date of infection and the development of clinical signs and that many cases of mal-nutrition, malaria, anemia, undertermined fever etc., may result from this toxemia.

Then were it possible to discover these potentially diseased cases, who may or may not break down later, there would be only a small percentage of tuberculous victims unaccounted for. After having done what can be done to prevent the infection then our efforts must be directed towards the attempt to limit the degree of infection. A mild degree of infection seems to exert some beneficent effect as well as endangering the life of the person. Experiments done on guinea pigs at Saranac Lake[7] hospitals indicate that an exposure with tuberculosis bacilli of low virulence produces considerable immunity. In actual life this experience is borne out to some degree.

Statistics of conjugal tuberculosis show that it is uncommon. The Trudeau Sanitarium point out the fact that among the healthy employees there numbering into the hundreds, only one has ever developed clinical tuberculosis. These experiences indicate that a re-infection from without or of exogenous origin is unlikely to occur unless the bacilli are in unusual numbers. The experiments done on the guinea pigs as noted before showed further that under a poor diet and by fatiguing an apparently convalescent animal would develop tuberculosis and die. This has been shown in a large way in Germany. Ickert[10] states that the mortality of young children increased 100%; school children less than 50%; older persons the increase was 200%. The infants suffered from the fact that their mothers had to become wage earners and the youths from becoming wage earners themselves. Fully 62% of the youths and older persons were known to have a familial taint. This not an increase of chances of infection but is the same course that has developed in all the countries where undernourishment has come to pass as a national catasthrophe. Oldenberg relates that in a long series of cases that children who develop clinical pulmonary tuberculosis that it is more apt to recur during an intercurrect infection, lapse of hygienic living, and to poor diet. Relapses become more and more difficult to control.

With these established facts before us the third and most important step in the eradication of tuberculosis becomes apparent. Every child coming from a home where a case of tuberculosis exists must be regarded as potentially a consumptive and its health guarded in such a way that it will be able to overcome the infection. Every child suffering from malnutrition or undertermined fever must be regarded in the same catagory. Until the family physicians take these things seriously and take to themselves the responsibility of treating these children and by examining them often little will be done to prevent the infections from becoming clinical cases.

UROLOGY

MILTON WEINBERG, M. D., Sumter, S. C.

Keyser, Linwood D.: The Mechanism of the Formation of Urinary Calculi. Annals of Surgery, Vol. 77, No. 2, February 1923, Page No. 210.

This paper represents an experimental study of the etiology of urinary calculi. The writer mentions the various constituents of urinary stones which are uric acid, urates, calcium oxalate, calcium phosphate, calcium carbonate, ammonium magnesium phosphate, and less often, cystin or xanthin. All are insoluble in water, even within the range of acidity or alkalinity which we find in urine. While these substances are found in the urine of normal persons, the problem of discussion by the writer is why there is a fusion and a typical deposition into a stony concrement, instead of their remaining isolated, single, and unfused and perfectly formed.

He states that the power of the urine in health to hold these constituents of calculi in solution, or to bring about their reposition as islolated entities, is due to the presence of finely divided particles of organic matter, the so-called protective colloids. The urinary colloids are incompletely known, but are supposed to include the urinary pigments, traces of nucleoalbumin,

tors in maintaining urinary solutions.

mucin, and albuminous material from effete cells cast off from the renal parenchyma. The reaction of the urine and the body temperature are also important fac-

As quoted by the writer, Ebstein and Nicolaier, in 1891, studied the chemical nature of urinary calculi and for the first time produced stones in the urinary tract of animals by feeding oxamid, a derivative of oxalic acid.

Rainey, in 1856, and later Ord and Shattock, determined the physical principle that colloidal matter *in vitro* would modify crystalline morphology.

The writer further states, "During the past two years the experimental production of calculi has been studied by the feeding of oxamid. The details of this study are published in another report, but in brief the results were as follows: Synthetic oxamid on being fed to rabbits and dogs was found to be excreted as such, in the urinary tract. On being deposited from the urine it assumed an entirely different crystalline morphology from that of the synthetic product fed. The crystals had changed from a non-fusing to a fusing or coalescent variety, this fusion of crystals leading to stone formation. The process seemed to be related to the urinary colloids as the reaction of the urine did not interfere with the process and as the synthetic oxamid crystals, when dissolved by heating in animal urine, would be reprecipitated on cooling with a morphologic change to the fusing spheroidal crystalline types."

"These experiments suggested that stone formation might be due to one of several factors: (1) The excretion of an excessive quantity of crystalline material beyond the power of the urinary colloids to maintain either solution or deposition of isolated non-coalescent crystals; (2) a deficient amount of protective colloid in the urine, and (3) the precipitatiion of normal colloids or masking of their protective activity by bacterial exudates, or by foreign colloidal matter excreted as the result of an abnormal metabolism."

In the experimental production of an excessive crystalline excretion, Keyser used nomal butyl oxalate subcutaneously. In this manner he produced urinary calculi, composed of calcium oxalate. The deposits were in the lumen of the tubules and none within the glomerulus or its capsule or in the proxima convuluted tubules. The calcium oxalate crystals, in order to form stones, changed from a non-fusing to a fusing or coalescent type.

The writer states, "We may assume that, by enormously increasing the quantity of the crystalloidal calcium oxalate in the urine, we overwhelm the protective colloids of the urine which were present only in amount sufficient to maintain the soluttion of crystalline islolation of the quantity of oxalate excreted passed the limit of that capable of being handled by the urinary colloidal machinery, then fusion of crystals and calculus formation took place."

In his experimental efforts to show the possibility of stone formation from a deficiency of urinary protective colloids, the writer has had no success. He states, however, that "Lichtwitz has demonstrated that the removal of colloidal matter from urine *in vitro*, either by extraction with ether or benzene, or by dialysis, uniformly in a precipitation of phosphates or of calcium oxalate. Furthermore, Schade of Kiel, in 1909, produced stony masses *in vitro* by clotting fibrinogen in the presence of freshly precipitated phosphates, oxalates, and carbonates, thus giving tremendous impetus to the significance of colloidal factors in stone fomation.

In his experimental work of producing lithiasis from bacterial exudates, the writer has had much success. He has found that oxalated crystals would change to the spheroidal coalescent variety by direct in-

fection of the kidney. He states, "Rosenow and Meisser, working with streptococci from the urine of patients with multiple recurrent calculi, have repeatedly produced calculi in the kidneys of dogs by the methods of specific bacteriology. These streptococci were implanted in devitalized teeth of dogs which developed urinary calculi consistently after an interval of several months." He thinks that infection interferes with the normal colloidal balance of the urine, thus affecting its solvent power.

SURGERY

SAMUEL ORR BLACK, M. D., Spartanburg, S. C.

THE CANCER PROBLEM

During the year of 1922, approximately 80,000 people died in the United States of cancer. That is twice the total number of lives lost by our army and navy combined during their recent two years participation in the European War.

The great problem in cancer today is to find the cause.

Cancer has been defined as an unlimited and unrestricted overgrowth of cells. Repeated mild irritation is unquestionably a factor in its etiology and a chronic inflammatory condition often passes into a malignant disease.

Until the etiology has been settled, cancer will continue to run rampant through the civilized lands unless the people are taught that their only salvation lies in the early recognition of this dreadful scourge.

Every crack, fissure, ulcer, sore or tumor which does not heal rapidly under simple medical care is potentially malignant.

Cancer is more frequent in the cavities of the body where an acid medium exists than where an alkaline one is present. Thus it is that cancer is seen 98 times in the acid large bowel to 2 times in the alkaline small bowel.

Many cases of cancer are preventable. Especially is this true of superficial cancer. Necrotic tooth roots, the sharp edge of a tooth cavity, ill fitting plates, excessive and prolonged smoking, luetic leukoplasia of the tongue frequently cause cancer in the buccal cavity and the removal of these and similar offending agents will almost in themselves wipe out cancer in the oral cavity.

McCarty states that he has never seen a cancer in the breast sections of which did not reveal the presence of chronic cystic mastitis. This condition is essentially a chronic inflammatory lesion, is easily removed, and is unquestionally precancerous in its nature.

The family physician should insist that all his female patients, aged 35 or more, especially those who have borne and nursed children should have a uterine and breast examination at least three times every year.

Out of the last 52 consecutive cases of uterine and breast carcinoma seen by ourselves, none of the uterine cases was operable, so far advanced was the lesion. Surgery has practically been discontinued for uterine cancer. These cases are best treated by radium and deep Roentgen Therapy.

But little can be further expected from surgery, as regards longevity in cancer. The only alternative is to find a "specific", and that apparently being as far away now as it was 40 or more years ago, the only remaining way by which the mortality can be lessened, and human life and happiness ex-

tended, when threatened with this terrible thing, is to get the patients earlier than here-to-fore, and preferably to get them before the lesion itself has become malignant.

PUBLIC HEALTH

LEON BANOV, M. D.,
Health Officer, Charleston County,
Charleston, S. C.

THE DRUGLESS HEALER

The development of medicine like the development of all sciences, has always paralleled the general progress of mankind.

When humanity was steeped in ignorance and superstition, the physician of that benighted day practiced medicine according to the demonic theory—his problem was to exorcize the offending demons in order to affect a cure for his patient; and the potato carried about in the pocket and the amulet of assafoetida and camphor worn by the superstitious of today, remind one that along with our rich heritage of learning which has been handed down to us from past generations, we have also received a modicum of superstition and a goodly portion of gullibility.

This perhaps explains why Elisha Perkins, when he proclaimed to the world a century ago, that he could cure all the ills that man is heir to, merely rubbing the sick one with his "tractor", acquired affluence and world wide fame as the inventor of an instrument intended to banish sickness from the face of the earth.

This will also probably explain the sale of thousands upon thousands of electric belts for the alleviation of human suffering less than a quarter of a century ago; and the man who fails to recall the highly polished tin can which brought a price ranging from $25.00 to $100.00 per can under the guise of "oxydonor" or other high sounding pseudo scientific name is in need of a memory training course.

Of course everything has its fads and fashions, and the tractor is a forgotten incident, while the electric belt and the "oxydonor" are entirely out of style today. Human gullibility is just as keen today however, as it was ten centuries ago, and the trickster and the charlatan is just as popular as he was a thousand years ago. Methods may change with the years, tricks may put on new garments to conform with the times, but the harpy who fattens on the hopes of suffering mankind is of the same indentical type that grew wealthy in the centuries gone by through the sale of charms and amulets when entire cities died of cholera and bubonic plague.

The center of the stage seems to be occupied at the present time by the "drugless healer." This non-medical practitioner of medicine offers to cure all ills either by thumping your spinal column or by shooting so many ohms of electronic energy (whatever that may mean) at you, or by making you repeat a certain formula over and over again until the desired effect has been produced—namely, the payment of a fee.

It is said that a bow-legged man hesitated about taking the Coue treatment for fear that an overdose might make him knock-kneed.

We have no such fears on the matter. Nor are we concerned with the fact that in adjusting the spine or suggesting to the

subconscious, these so-called healers manage at te same time to make satisfactory adjustments of the patient's purse string.

We are concerned however, by the thought that these chiropractors, naturopaths and other what nots who try to treat diseases without even attempting to make a diagnosis; and who perhaps can do very little harm to a person who is not very ill, can do irreparable mischief to a patient suffering from an organic complaint, or from a condition requiring prompt medication by delaying proper treatment and thereby endangering perhaps, the patient's chances of recovery.

Suggestive therapeutics have been used for a number of years by the medical profession; and there is no doubt but that an imaginary ailment will often yield to an imaginary remedy; but the practice of medicine should be left to those only who through proper study of anatomy, physiology, chemistry and the other essential subdivisions of the science of medicine, have become fitted for the proper diagnosis and treatment of diseases.

SOCIETY REPORTS

GREENVILLE COUNTY

Greenville County Medical Society held an interesting meeting March 5th, Dr. T. R. W. Wilson, Pres. in the chair.

Sixteen answered to roll call. There are seventy-four members of this society.

Dr. J. L. Sanders read a paper on "Para-Nasal Sinus Infection." Discussion of Dr. Sanders' paper was lead by Dr. L. O. Mauldin.

Interesting case reports were made by Drs. T. R. W. Wilson, J. M. Fewell, A. E. Brown, and J. L. Sanders.

The attendance was unusually small, due to the presence of other attractions in the city that night, but an inspiring service was held for the few by Dr. R. E. Truesdale, pastor of the M. E. Church.

It was announced that the 1924 meeting of the Tri-State Medical Society would be held in Greenville. Action was taken whereby no local man will offer a paper on the program, this being done to prevent a local monopoly so far as the program is concerned.

Officers of this society for the year 1923 are: President, Dr. T. R. W. Wilson, Vice-President, Dr. C. C. Ariail, Secretary, Dr. J. D. Guess, Treasurer, Dr. E. W. Carpenter.

Delegates to the annual meeting in Charleston: Drs. A. E. Brown, W. C. Black, T. M. Davis, C. H. Fair.

NEWBERRY COUNTY

The Newberry County Medical Society met February 9th, 1923. Dr. J. M. Kibler, Pres. in charge.

Minutes of last meeting read and approved.

Ten members answered roll call.

Dr. J. H. Moore, of the Loomis Sani-, New York, sent his dues, and news of decided improvement in health.

Dr. Knotts of the Newberry County Health Unit, read a fine paper on tuberculosis as a public health problem. He also reported thirty-six deaths due to tuberculosis, seven white and twenty-nine colored, for Newberry county during 1922. This does not include the city of Newberry health record.

J. K. Wicker, M. D., Sec.

PICKENS COUNTY

The Pickens County Medical Society held its regular monthly meeting on March

7th, eleven members being present.

Number of names on roll are twenty-three.

Dr. L. G. Clayton, president of the society, called the meeting to order.

There were no papers read but a number of case reports presented. One, "Congenital Syphilis," by Dr. P. E. Woodruff, was instructive: Also, a case of hemorrhage, first apparently from the stomach, and later from the bowel, by Dr. W. B. Furman.

Dr. L. O. Mauldin, District Councilor, was present, and besides well chosen remarks for the good of our society and the profession generally, told us some new things to do for ear trouble

Dr. C. P. Corn, of Greenville, was also present and talked to us about the use of the cystoscope.

Officers for the present year are as follows:

Dr. L. G. Clayton, President, Dr. F. L. Webb, Vice-president, Dr. J. S. Bolt, Secretary, and Treasurer.

Delegates to the annual meeting in Charleston: Drs. J. L. Valley, W. A. Tripp.

ORANGEBURG COUNTY

The Orangeburg County Medical Society held it's regular monthly meeting in Orangeburg, February 8th, 1923.

Fifteen doctors answered to roll call, and two visitors were at this meeting.

The program was as follows:

Lobar Pneumonia, by Dr. G. H. Walter. This paper was freely discussed by Drs. L. C. Shecut, W. C. Myers, H. P. Moore, and Kenneth Lowman, of the U. S. Navy.

Dr. G. M. Smith, the county veterinarian, read a very interesting paper on the development of veterinary science, and the work up to date.

Surgeon Kenneth Lowman, U. S. N. gave a graphic discription of his recent visit to the West Indies, Panama, and Japan.

He also told of the methods used in the Navy for preventing disease.

After the meeting a dinner was served at the Orangeburg Hotel.

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THE COST OF WORK—IN CALORIES

Now and then it falls to the professional duty of the physician either to prescribe some form of work for his patients or to consider the possible suitability of the tasks in which they are customarily engaged. Thus, there is added to the many requirements for acceptable medical practice the duty of becoming an expert on the subject of both muscular and mental effort. Exercise must be prescribed for some persons; others must be prevented from engaging in overstrenuous occupation. Personal experience becomes a helpful teacher in enabling us to pass judgment on various degrees or types of exercise; and now science is coming to our further assistance. The study of energetics bears out experience in telling us that lumbering is a calory-consuming occupation in which the daily need of food fuel may rise to 6,000 calories. Hence, Lusk is moved to remark that the prover-

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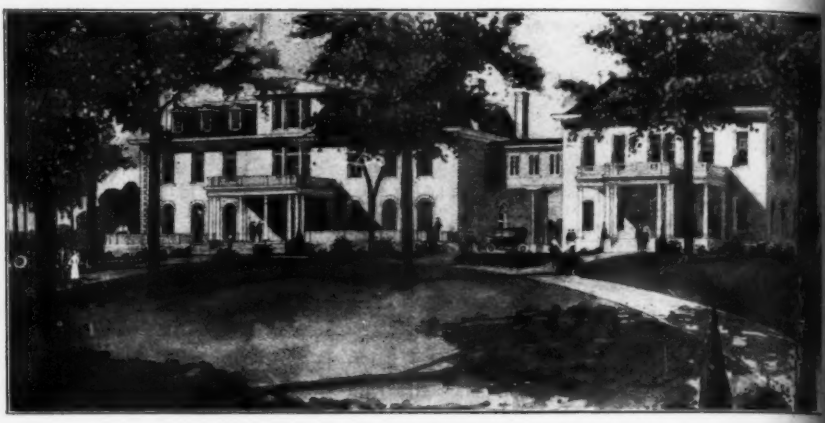
bial reputation of sawing wood as a strenuous occupation has here its scientific verification, and explains the disinclination of the hungry to engage in this useful occupation, as well as the unpopularity of charitable wood yards. The wood yard and the stone pile are more likely to be involved in a sentence to jail than in a physician's directions. The easier tasks that permit suitable function without overtaxing an impaired heart or some other organ are usually expressed in medical literature in terms of dumb-bells or Indian clubs or stairclimbing. Most considerations of this sort have involved the male sex and its vocations. Of late, new data have accumulated with respect to the energy expenditure of women in household occupations. The figures for rest approximate 60 calories or, in round numbers, a calory per kilogram, hourly. Such work as sewing requires the additional expenditure of from 10 to 15 per cent. of energy; for dishwashing or ironing the increment mounts to 20 per cent. or more, while the rapidly vanishing vocation of sweeping may make an extra energy demand of 65 per cent. an hour. According to the information issued from the Office of Home Economics at Washington, it appears that knitting, crocheting, darning and sewing by hand make moderate demands on the body as regards energy expended, compared with washing, ironing, sweeping and dishwashing. This does not take into account such matters as fatigue from sitting in one position, from monotony of work, or similar factors, but simply the energy expenditure for the work done. Here is a liberal range of choice of therapeutic tasks for women. And lest the list should seem to be too conservative, let us add that the work of typewriting, according to Carpenter, belongs in the dishwashing group of muscular exertions.—Jour. A. M. A., Jan. 20, 1923.

LUNG VOLUMES IN CERTAIN HEART LESIONS

The ordinary sequence of events in heart patients with lung involvement, according to the findings of Christen Lundsgaard, New York (Journal A. M. A., Jan. 20, 1923), and his interpretations, is as follows: In the very first stage of a (mitral) lesion in which the main clinical symptoms are the accentuated pulmonic second, the concentric hypertrophy of the heart and the murmurs, the only abnormality found may be an increased residual air. In the course of time when the stasis lasts long enough, the total volume begins to decrease, owing to the increasing influence of the previously mentioned factors. The residual air may, however, still be increased. At last a period of broken compensation occurs, with further decrease in the total capacity. In this period, however, the residual air is diminished, often to a considerable degree. From this it appears natural that the vital capacity in heart patients cannot in the course of effective treatment increase to its normal value. Even if the total capacity becomes normal, the residual air remains increased on account of the increased pressure in the pulmonic circulation necessary for the establishment of compensation. The vital capacity, therefore, must remain somewhat diminished.



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